

R6. COMMENTS AND RECOMMENDATIONS

The following are some comments and recommendations based on the results of remote sensing study undertaken as part of the study.

6.1 Landsat Data Analysis

- (1) In this study, false color imagery of relatively good quality has been developed covering the entire country. It turns out to be a most typical imagery to be producible from Landsat data, so that it should serve as good reference for similar imagery to be developed in the future in terms of picture qualities and color tones.
- (2) The vegetation and landuse map and the landform map were compiled primarily on the basis of existing data and interpretations of Landsat imagery with a relatively short period of field work. Therefore, information presented in these maps are to be further substantiated by details to be obtained in the field as they are used in actual projects.
- (3) It is recommended that satellite based nationwide landuse survey will be conducted preferably every ten years or shorter depending on the arise of such needs and/or availability of fund.
 - In the current study, Landsat MSS data (ground resolution: 80m x 80m) were used and analysis made at a scale of 1/250,000. for areas that require more detailed information on a larger scale map (1/50,000 or 1/100,000), it is recommended to use aerial photography, TM data (ground resolution: 30m x 30m) or SPOT data (ground resolution: 20m x 20m).
- (4) Since the Landsat data used in the study were chosen to be of less cloud coverage, all of them were of a dry season (January to March). If rainy season data are effectively used (though they are usually limited in use due to cloud coverage), seasonal changes in river flow and landuse can be studied.
 - Variation of area and water level of the lakes including Lake Victoria can be studied, though it is not addressed in this present study, by comparing Landsat imagery with reliable topographic maps in terms of relative heights. Assessment of the lake water quality from the imagery is yet in a research and development stage, but in time it is quite likely that imagery will be used for monitoring of water quality.

6.2 NOAA Data Analysis

- (1) The present study included analysis of vegetation covers as of 1982 which were characterized by widespread effects of droughts in the preceding years and those of 1989 and 1990 which represent average climatic conditions, and the results have been organized in imagery and made into data files, thus laying baseline information for future reference.

- (2) Unlike other satellite data, NOAA data are observed every day. With ground resolution of roughly 1km x 1km, NOAA data are effective for capturing vegetation information for large areas, but for more detailed study they need to be supplemented by more accurate data such as Landsat, SPOT, aerial photos and field work.
- (3) It is recommended to carry out nationwide study of vegetation cover preferably at every 10 years or shorter. When droughts or floods occur, NOAA data are useful for immediate monitoring of the situations at those occasions.

TABLES

TABLE R2.1 Landsat System

DESCRIPTION OF LANDSAT S-1, -2, -3, -4, and -5

Launch Date: Landsat-1 - July 23, 1972; terminated January 6, 1978
 Landsat-2 - January 22, 1975 ; inoperational since February 25, 1982.
 Shutdown July 1983.
 Landsat-3 - March 5, 1987; of limited use by March 1982.
 Shutdown Sept. 83.
 Landsat-4 - July 16, 1982 ; TM Transmitter loss Feb.1983.
 Landsat-5 - March 1, 1984

Ground Coverage : Between latitudes 81 N and 81 S.
Repetitive Coverage : Landsat-1, -2 and -3 - 18 days :
 Landsat-4, and -5 - 16 days
Satellite Altitude : Landsat-1, -2, and -3 - Approximately 900 km
 Landsat-4 and -5 - Approximately 700 km

Sensors:

A. Multispectral Scanner (MSS), Landsat-1, -2, -3, -4 and -5:

<u>Spectral Band</u>	<u>Wavelength (micrometres)</u>	<u>Spectrum</u>
4 (1)	0.5 - 0.6	Green, Yellow, Orange
5 (2)	0.6 - 0.7	Red
6 (3)	0.7 - 0.8	Reflective Infrared
7 (4)	0.8 - 1.1	Reflective Infrared
8	10.4 - 12.6	Thermal Infrared (Landsat-3 only)

- . Spatial Resolution : 79 m
- . Image Format : 185 km by 185 km
- . Thermal Infrared (band 8) failed to function properly.

B. Return Beam Vidicon (RBV), Landsat-3:

- . Panchromatic : 0.505 - 0.750 micrometres
- . Spatial Resolution : 38 m
- . Image Format : Two cameras aligned to view an across track pair of 98 square km ground scenes with 14 km of sidelap. Two pairs view the same area as an MSS scene.

C. Thematic Mapper (TM), Landsat-4 and -5:

<u>Spectral Band</u>	<u>Wavelength (micrometres)</u>	<u>Spectrum</u>
1	0.45 - 0.52	Blue
2	0.52 - 0.60	Green/Yellow
3	0.63 - 0.69	Red
4	0.76 - 0.90	Reflective (near) Infrared
5	1.55 - 1.75	Reflective (middle) Infrared
6	10.40 - 12.50	Thermal (far) Infrared
7	2.08 - 2.35	Reflective (middle) Infrared

- . Spatial Resolution : 30 m (Band 6, 120 m)
- . Image Format : 185 km by 185 km

Table R 3.1 List of Landsat Data

Location	Date	Cloud Cover (%)	Data Quality
P R			
166/57	1987.1.26	10	8888
166/58	1987.1.26	10	8888
166/59	1987.1.26	10	8888
166/60	1987.1.26	10	8888
166/61	1987.1.26	10	8888
166/62	1987.1.27	30	8888
166/63	1987.1.26	10	8888
167/57	1987.2.02	0	8888
167/58	1987.2.02	0	8888
167/59	1987.2.18	10	8888
167/60	1987.2.18	10	8888
167/61	1987.2.18	10	8888
167/62	1987.2.18	10	8888
167/63	1987.2.18	10	8888
168/57	1987.2.09	10	8888
168/58	1987.2.09	10	8888
168/59	1987.2.09	10	8888
168/60	1987.2.25	10	8888
168/61	1987.2.25	10	8888
168/62	1987.2.25	10	8888
169/57	1987.3.01	0	8888
169/58	1987.3.01	10	5555
169/59	1987.3.01	0	8888
169/60	1987.3.01	10	8888
169/61	1987.7.10	10	8888
170/57	1987.2.07	10	8888
170/58	1987.2.07	10	8888
170/59	1987.1.06	10	8888
170/60	1987.1.22	10	8888
170/61	1987.2.22	10	8888
171/57	1987.1.31	10	8888

Remarks ; Data quality shows data quality of Band 4,5,6,and 7.
8 ; good, 5; fair, 2 ; poor

Table R 3.2 Vegetation/Landuse Map Legend

Symbol	Classification	Remarks
F1	Forest	Forest (Dense of Crown)
F2	Woodland	Forest (Sparse of Crown)
Bu1	Bushland (Dense)	Dense Bushland and Shrubland
Bu2	Bushland (Sparse)	Sparse Bushland and Shrubland
G	Grassland	Grassland
B1	Barrenland (S/G)	Barrenland with Sand & Gravel
B2	Barrenland (R)	Barrenland with Rock
S	Swamp	Swamp
W1	Waterbody	River, Lake, etc.
W2	Waters (Artificial)	Dam & Reservoir
C1	Agricultural land (Dense)	Agricultural land (mainly use for crop raising or grazing)
C2	Agricultural land (Sparse)	Agricultural land (mixed Bushland and Grassland)
C3	Plantation	Plantation and Ranch
T	Town	Towns or Villages
O		Reservoir (small in size)
C3 :	will be further classified as follows, if types of plants can be identified.	
	Cto : Tea	Ccs : Cashewnut
	Csu : Sugar Cane	Cot : Cotton
	Ccf : Coffee	Cma : Maize
	Ccc : Coconut	Cri : Rice
		Crn : Ranch

* In the 1/1,000,000 Map, W1 & W2 were presented as W and O was not presented.

Table R 3.3 Landform Map Legend

Code	Landform
M	Mountains and major scarps
H	Hills
Hl	Hills and minor scarps
Hs	Step-faulted scarps of the Rift Valley
L	Plateau
LI	Plateaus and high-level structural plains
Ls	Step-faulted floor of the Rift Valley
Lc	Coastal Plateaus
Lu	Plateau/upper-level upland transitions
R	Volcanic footridges
F	Footslopes
FT	Footslopes
FY	Footslopes and piedmont plains undifferentiated
Y	Piedmont Plains
U	Uplands
Uu	Upper-level uplands
Uh	Upper middle level uplands
Um	Lower middle level uplands
Ul	Lower level uplands
Ux	Uplands Undifferentiated levels
Uc	Coastal uplands
Up	Uplands/high-level plain transitional lands
Pe	Erosional Plains
Pn	Non-dissected erosional plains
Pd	Dissected erosional plains
Ps	Sedimentary plains
Psh	High-level sedimentary plains
Psm	Middle-level sedimentary plains
PsL	Lower-level sedimentary plains
Psx	Sedimentary plains of undifferentiated levels
Pv	Volcanic Plains
pc	Coastal Plains
Pch	Higher-level coastal plains
Pcl	Lower-level coastal plains
Pcr	Reef coastal plains
Pl	Lacusirine Plains
Pt	Sedimentary Plains of upper river terraces
Pf	Sedimentary Plains of large alluvial fans
Pf1	Older fans
Pf2	Younger fans

A	Floodplains
B	Bottomlands
C	Dunes or dune land
La	Lava flows
S	Swamps
T	Mangrove swamps
V	Minor valleys
W	Badlands
Z	Coastal or lake-side beach ridges

* In the 1/1,000,000 Map, only major classifications were presented

**Table R 3.4 Area of Vegetation and Landuse
(NWMP study 1990)**

Unit : sq km

Symbol	Classification	Area	%
F1	Forest	14,595	2.46
F2	Woodland	21,438	3.62
Bu1	Bushland (Dense)	246,663	41.65
Bu2	Bushland (Sparse)	107,877	18.21
G	Grassland	11,941	2.02
B1	Barrenland (S/G)	4,558	0.77
B2	Barrenland (R)	71,980	12.15
S	Swamp	6,545	1.14
W1	Waterbody	11,794	1.99
W2	Waters (Artificial)	160	0.03
C1	Agricultural land (Dense)	45,578	7.70
C2	Agricultural land (Sparse)	32,151	5.43
C3	Plantation	16,352	2.76
T	Town	430	0.07
	Total	592,262	100.00

Note: As measured on Vegetation Landuse Map 1/1,000,000 prepared by this NWMP Study.

Table R 3.5 Land Use in Kenya (KREMU Map 1983)

Land Use Classes	Area in (*) 1,000 sq km	Area in %
1. Settlement and associated non-agricultural area	0.3	0.05
2. Horticulture and market gardening	0.3	0.04
3. Perennial cropland	19.0	3.26
4. Arable cropland	44.6	7.66
5. Improved grazing land	32.0	5.49
6. Unimproved grazing land (rangeland)	433.0	74.31
7. Woodlands and forests	36.9	6.33
8. Water bodies	11.8	2.03
9. Badland or barren (agriculturally unproductive)	4.8	0.83
Total	582.6	100.00

Notes:

- (1) Acreage of each Class is planimetered on "Land Use Map in Kenya" prepared by Kenya Rangeland Ecological Unit (KREMU), 1983
 - (2) Perennial cropland include tea, sugar cane, coffee, bananas, pyrethrum, cassava, sisal, pineapples, coconuts and cashew nuts
 - (3) Arable cropland include maize, rice, cotton, tobacco, wheat, English potatoes, barley, sorghum/millet and beans/green grams/pigeon peas.
- (*) Source: NWMP Progress Report (1), March, 1991

Table R 5.1 Monthly Rainfall Records

Location Month	Unit: mm											
	Lodwar	Marsabit	Moyale	Mandera	Wajir	Kisumu	Kenicho	Nairobi	Garissa	Lamu	Voi	Mombasa
1	9	92	17	2	8	62	94	53	13	6	34	38
	111	312	160	17	78	186	289	230	97	58	152	130
	0	0	0	0	0	0	14	0	0	0	0	1
2	8	60	19	7	5	88	112	48	7	4	29	16
	42	214	125	132	43	258	227	207	39	40	190	90
	0	0	0	0	0	0	10	0	0	0	0	0
3	21	91	56	19	35	158	167	102	38	25	79	55
	149	200	173	161	159	334	321	291	252	241	413	235
	0	0	0	0	0	14	19	3	0	0	0	1
4	49	149	180	93	75	216	251	219	68	130	100	161
	186	267	395	286	304	405	482	493	251	476	297	601
	0	32	27	0	0	93	114	15	3	5	0	19
5	25	54	124	31	34	173	291	174	20	329	30	236
	114	138	397	184	246	358	482	512	132	751	160	772
	0	4	8	0	0	71	120	34	0	11	0	36
6	9	14	17	1	2	88	228	43	8	164	6	76
	116	58	92	7	22	192	361	199	31	510	77	182
	0	0	0	0	0	14	128	0	0	7	0	3
7	20	17	17	1	3	66	206	19	3	75	3	67
	152	49	89	13	48	147	343	130	17	255	27	205
	0	2	0	0	0	15	114	0	0	8	0	5

(Continue ...)

Locanon Month	Lodwar	Marsabit	Moyale	Mandera	Wajir	Kisumu	Kenicho	Nairobi	Garissa	Lamu	Voi	Mombasa
8	10	8	16	2	2	98	226	26	8	40	8	65
	63	29	94	4	35	220	403	85	39	164	66	216
	0	11	0	0	0	17	45	1	0	0	0	9
9	4	9	24	2	5	79	181	24	7	39	15	74
	57	13	135	26	129	151	323	111	58	487	138	356
	0	0	0	0	0	2	107	1	0	0	0	0
10	10	72	109	44	28	75	161	55	24	40	26	96
	89	149	388	157	164	195	299	187	169	340	150	328
	0	1	9	1	0	9	38	3	0	0	0	10
11	17	91	87	44	63	120	136	135	79	39	106	95
	150	244	267	191	621	449	299	587	419	215	334	316
	0	45	5	0	0	6	72	33	1	0	0	4
12	11	46	39	9	23	100	81	83	77	28	119	70
	198	112	161	104	292	301	135	348	181	197	591	172
	0	0	0	0	0	1	8	4	0	0	0	2
Year	193	693	705	255	283	1,323	2,134	981	352	919	555	1,049
	498	1,115	1,290	643	847	1,884	2,723	1,829	757	1,855	1,201	1,784
	19	324	387	42	74	942	1,583	511	69	322	184	544

Upper: average, middle: max., lower: min.

Observation period: Lodwar (1919-1980), Marsabit (1974-1980), Moyale (1915-1980), Mandera (1936-1980), Wajir (1917-1980),
Kisumu (1938-1980), Kenicho (1964-1980), Nairobi (1923-1980), Garissa (1931-1980), Lamu (1906-1980),
Voi (1904-1980), Mombasa (1946-1980)

Table R 5.2 Monthly Rainfall (1981-1982, 1988-1990)

Unit : mm

Year/Month	Lodwar	Marsabit	Moyale	Mandera	Wajir	Kisumu	Kericho	Nairobi	Garissa	Lamu	Voi	Mombasa
1981												
11	0	38.7	78.2	35.6	29.9	70.7	103.0	40.2	61.2	3.9	62.8	101.8
12	0	34.9	8.9	2.9	11.7	59.5	80.9	59.9	6.4	0	259.1	124.9
1982												
1	0	2.6	12.0	0	0	48.5	62.4	2.4	0	0	4.5	1.6
2	30.5	0.2	0.9	0	0.4	68.0	78.3	14.1	0.2	0	0	0
3	35.7	12.8	22.7	11.6	35.8	60.7	99.6	31.2	24.1	47.2	68.6	48.2
4	54.5	565.5	238.2	58.0	52.4	112.7	266.4	192.9	102.3	136.9	82.9	184.9
5	16.6	286.2	470.2	41.3	26.5	81.3	458.5	164.4	18.6	917.1	25.9	664.8
6	0	8.3	15.4	0	0.3	170.3	110.4	8.4	2.5	176.7	5.3	111.2
7	0.7	6.6	13.6	0	0.5	91.4	147.4	13.5	0	120.8	10.1	140.8
1988												
11	0.3	140.2	67.6	27.5	37.6	161.6	139.3	66.7	76.0	57.5	63.1	108.8
12	2.4	58.1	43.8	1.3	32.7	79.6	35.9	123.7	76.3	60.7	193.4	87.9
1989												
1	0	56.8	19.4	0	1.1	48.6	112.9	46.2	2.4	4.3	11.8	31.5
2	19.6	38.8	47.6	0.2	63.1	180.3	231.8	28.8	0	0	0	0.3
3	48.0	32.3	44.6	9.1	8.1	202.3	439.4	65.1	4.6	2.7	8.5	88.2
4	8.1	299.5	213.3	164.8	63.6	170.9	197.0	187.4	273.6	24.8	120.9	141.2
5	70.7	76.8	156.6	102.7	52.0	186.2	230.5	168.1	2.2	148.2	9.0	178.8
6	0	11.7	33.9	0	1.1	57.2	54.4	2.8	0	83.2	0	56.4
7	29.0	3.2	5.1	0	0	16.7	156.1	59.2	0.9	28.1	0	51.1
1989												
11	6.3	201.7	67.6	38.4	84.5	80.7	95.3	103.5	234.5	217.8	114.5	144.5
12	46.3	38.2	43.8	28.8	10.9	122.3	156.2	132.7	6.0	51.4	123.2	90.2
1990												
1	1.1	53.2	12.1	1.7	1.1	48.6	112.9	46.2	2.4	4.3	11.8	31.5
2	46.3	131.6	84.3	0	63.1	180.3	231.8	28.8	14.5	4.0	53.8	52.7

Table R5.3 (1) Vegetation Cover by Region (1/2)

Unit : x 10 km²

Region	LODWAR				MARSABIT			
	1982 Dry	1982 Wet	1989 Wet	1990 Dry	1982 Dry	1982 Wet	1989 Wet	1990 Dry
very high	305	11	4	1	159	76	113	314
high	391	35	74	66	179	80	466	681
moderate	708	199	358	597	348	508	1326	1042
sparse	1058	1433	1628	1193	889	3061	1805	1521
scarce	6276	7060	6629	7003	6069	3919	3934	4064
clouds	0	0	45	0	0	0	0	3
water	883	883	883	761	18	18	18	37
Total	9621	9621	9621	9621	7662	7662	7662	7662

Region	MOYALE				MANDERA			
	1982 Dry	1982 Wet	1989 Wet	1990 Dry	1982 Dry	1982 Wet	1989 Wet	1990 Dry
very high	20	0	0	0	0	0	0	0
high	87	0	0	14	0	0	0	3
moderate	413	18	33	225	109	109	10	7
sparse	918	1366	1097	952	389	1341	1164	432
scarce	1358	1412	1318	1605	952	0	0	1008
clouds	0	0	348	0	0	0	276	0
water	0	0	0	0	0	0	0	0
Total	2796	2796	2796	2796	1450	1450	1450	1450

Region	WAJIR				GARISSA			
	1982 Dry	1982 Wet	1989 Wet	1990 Dry	1982 Dry	1982 Wet	1989 Wet	1990 Dry
very high	2	5	78	22	205	111	1393	979
high	4	10	316	124	119	173	2699	2491
moderate	14	109	697	506	342	1798	2678	2622
sparse	711	4060	2678	2015	1019	5368	956	1396
scarce	4760	1307	1047	2823	6137	372	66	333
clouds	0	0	675	1	0	0	0	0
water	0	0	0	0	0	0	0	1
Total	5491	5491	5491	5491	7822	7822	7822	7822

Table R5.3 (2) Vegetation Cover by Region (2/2)

Unit : x 10 km²

Region	LAMU				MOMBASA			
	1982 Dry	1982 Wet	1989 Wet	1990 Dry	1982 Dry	1982 Wet	1989 Wet	1990 Dry
very high	117	117	570	328	369	339	163	256
high	402	473	1319	1476	561	589	454	971
moderate	588	1163	796	937	445	495	284	386
sparse	687	900	266	267	204	10	109	21
scarce	1161	53	16	18	36	0	30	1
clouds	0	0	0	0	0	0	584	0
water	89	338	77	18	31	213	22	11
Total	3044	3044	3044	3044	1646	1646	1646	1646

Region	VOI				NAIROBI			
	1982 Dry	1982 Wet	1989 Wet	1990 Dry	1982 DRY	1982 Wet	1989 Wet	1990 Dry
very high	80	271	1169	1202	866	649	1943	1174
high	208	531	1745	1354	1215	922	3370	2781
moderate	579	1947	1178	1152	2168	2262	1580	2359
sparse	1179	1701	391	716	1856	3026	339	920
scarce	2530	126	27	146	1299	545	92	115
clouds	0	0	66	5	0	0	80	23
water	0	0	0	1	0	0	0	32
Total	4576	4576	4576	4576	7404	7404	7404	7404

Region	KERICHO				KISUMU			
	1982 Dry	1982 Wet	1989 Wet	1990 Dry	1982 DRY	1982 Wet	1989 Wet	1990 DRY
very high	1022	779	305	265	945	304	85	163
high	914	782	1984	1864	634	672	644	1523
moderate	1282	1368	1152	1406	649	1240	1606	892
sparse	928	1117	670	672	369	241	503	219
scarce	211	342	278	176	55	11	47	13
clouds	0	0	0	6	100	0	27	0
water	32	1	0	0	576	860	416	518
Total	4389	4389	4389	4389	3328	3328	3328	3328

FIGURES

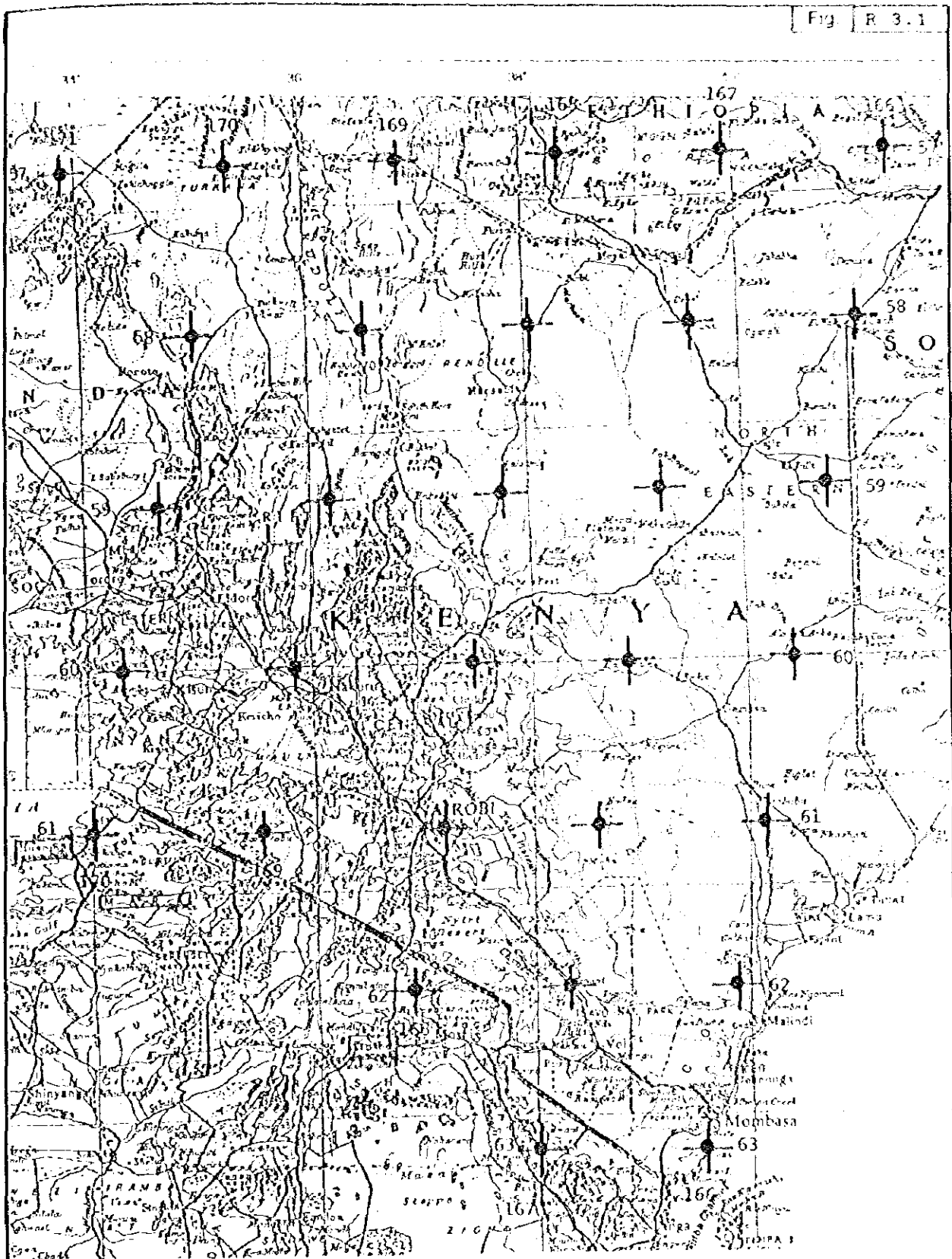
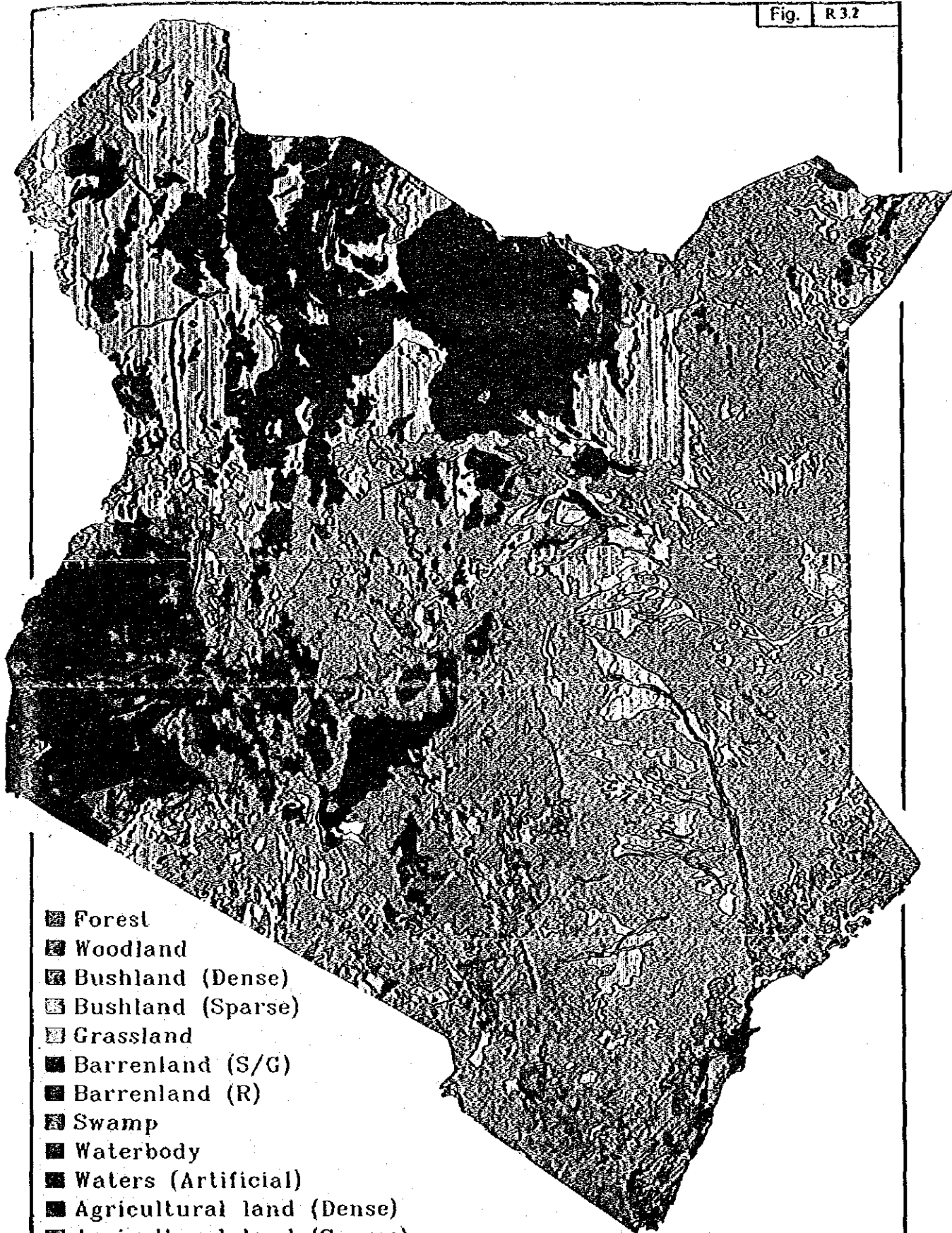


Figure R 3.1 Coverage of Landsat Data used for the Study

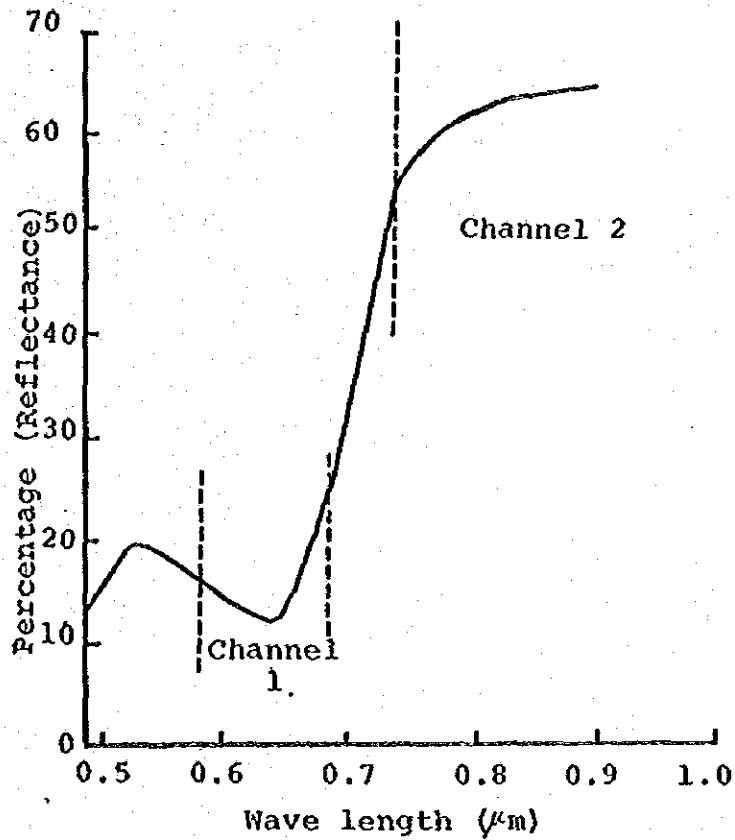
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- Forest
- Woodland
- Bushland (Dense)
- Bushland (Sparse)
- Grassland
- Barrenland (S/G)
- Barrenland (R)
- Swamp
- Waterbody
- Waters (Artificial)
- Agricultural land (Dense)
- Agricultural land (Sparse)
- Plantation
- Town

Figure R 3.2 Vegetation/Landuse Map

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* Hoffer, R.M. & Johansen, C.J., 1969:
 "Ecological Potential in Spectral Signature
 Analysis", Remote Sensing in Ecology, University
 of Georgia press, Athens, Ga., pp.1 - 16.

Figure R 4.1 Spectral Response Curve for a Green Leaf
 (chlorophyll pigment)*

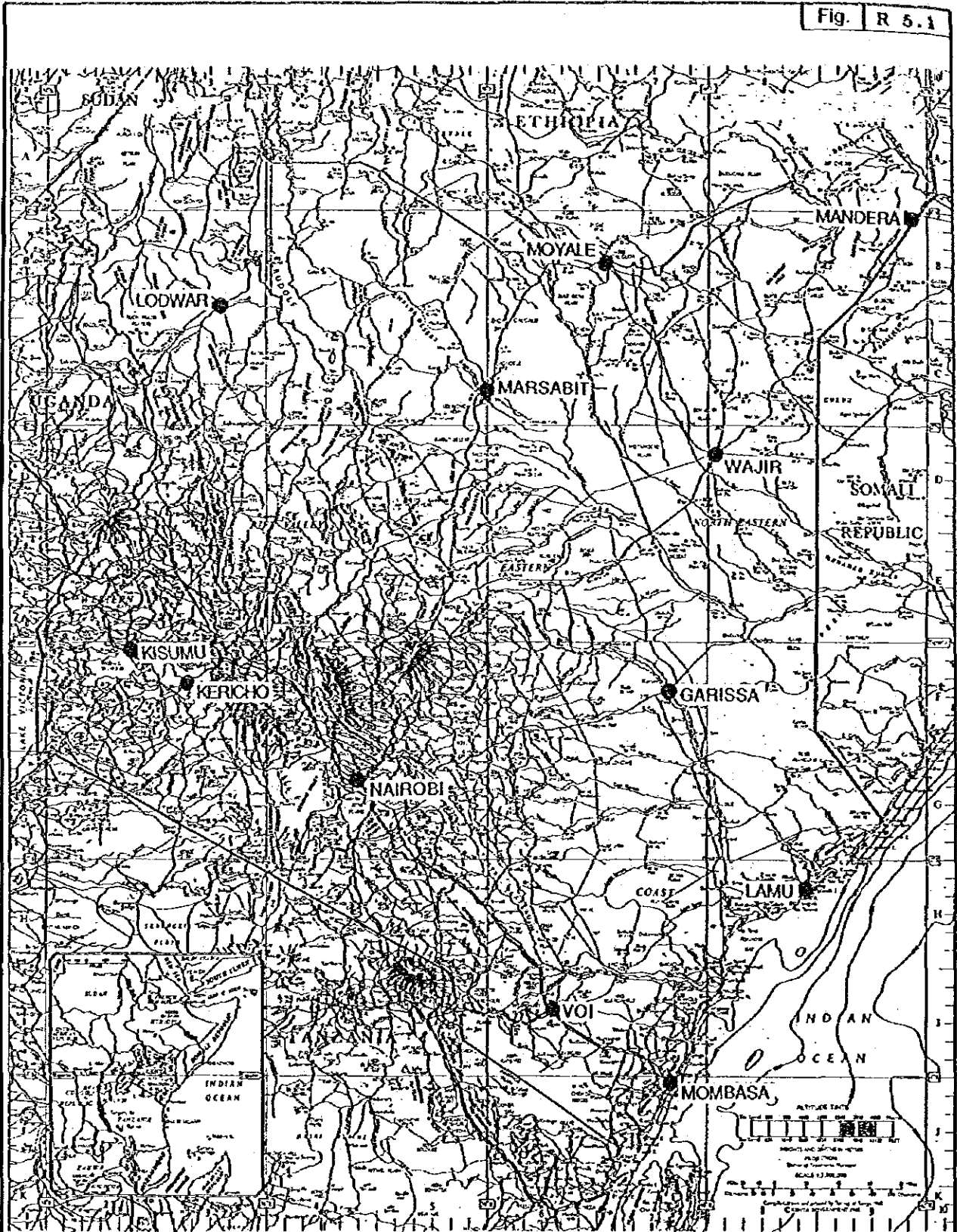
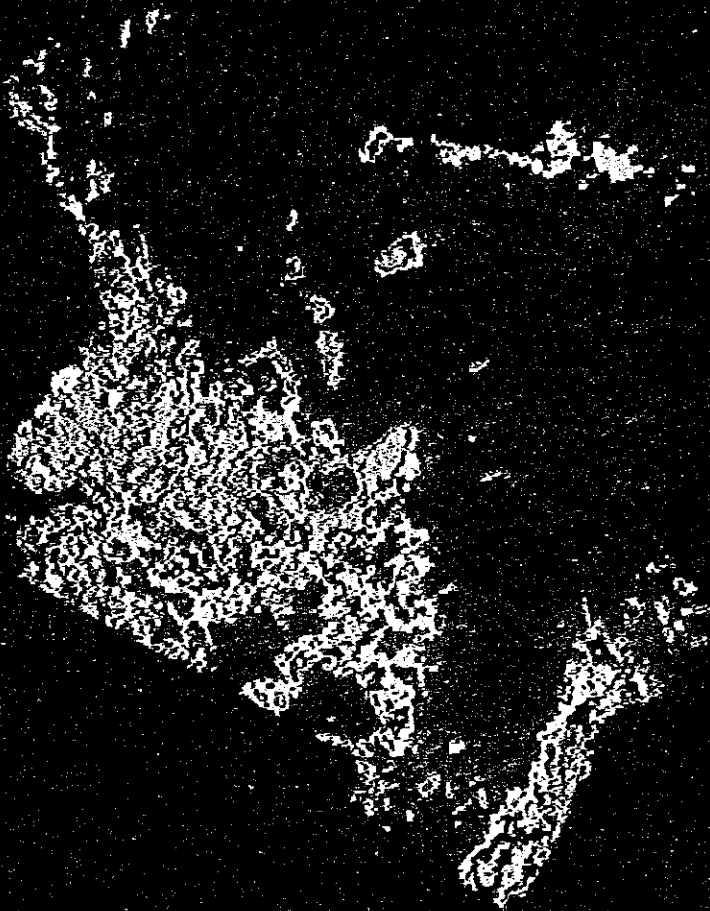


Figure R 5.1 Location of Rainfall Observatory Stations

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1982-dry



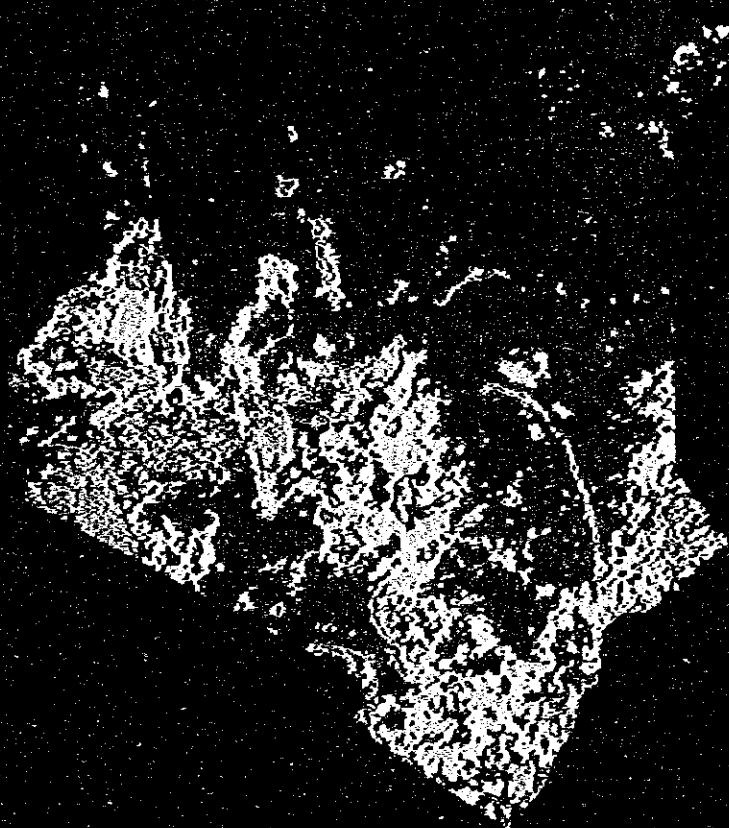
- 1 VERY HIGH VEGETATIVE COVER
- 2 HIGH VEGETATIVE COVER
- 3 MODERATE VEGETATIVE COVER
- 4 SPARSE VEGETATIVE COVER
- 5 SCARCE VEGETATIVE COVER
- 6 CLOUDS
- 7 WATER
- 8 FILL/NO IMAGE

Figure R 5.2 Vegetation Cover in 1982 Dry Season

Data on : 24-Jan 5-Feb
28-Jan 6-Feb

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1982-wet



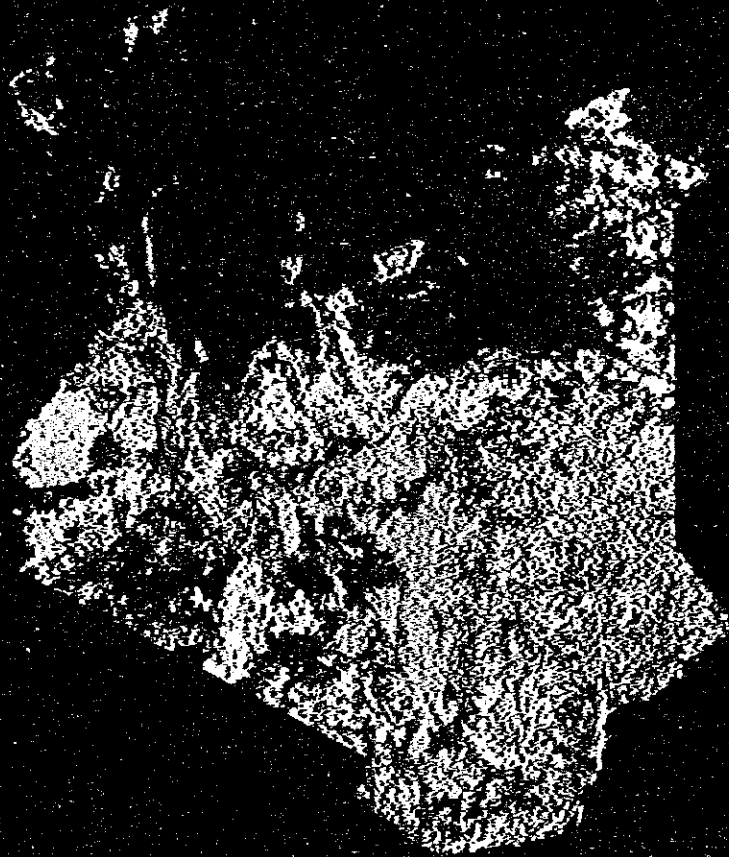
- 1 VERY HIGH VEGETATIVE COVER
- 2 HIGH VEGETATIVE COVER
- 3 MODERATE VEGETATIVE COVER
- 4 SPARSE VEGETATIVE COVER
- 5 SCARCE VEGETATIVE COVER
- 6 CLOUDS
- 7 WATER
- 8 FILL/NO IMAGE

Figure R 5.3 Vegetation Cover in 1982 Wet Season

Data on : 10-Jun 15-Jul
 19-Jun 19-Jul

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1989-wet



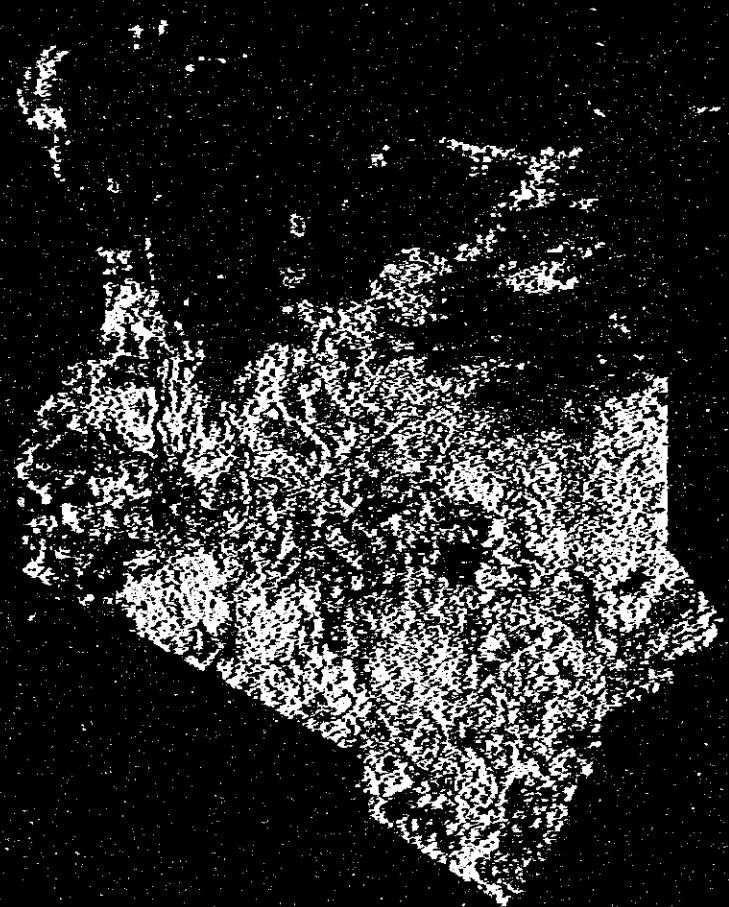
- 1 VERY HIGH VEGETATIVE COVER
- 2 HIGH VEGETATIVE COVER
- 3 MODERATE VEGETATIVE COVER
- 4 SPARSE VEGETATIVE COVER
- 5 SCARCE VEGETATIVE COVER
- 6 CLOUDS
- 7 WATER
- 8 FILL/NO IMAGE

Figure R 5.4 Vegetation Cover in 1989 Wet Season

Data on: 20-Jun
18-Jul
19-Jul

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1990-dry



- 1 VERY HIGH VEGETATIVE COVER
- 2 HIGH VEGETATIVE COVER
- 3 MODERATE VEGETATIVE COVER
- 4 SPARSE VEGETATIVE COVER
- 5 SCARCE VEGETATIVE COVER
- 6 CLOUDS
- 7 WATER
- 8 FILL/NO IMAGE

Figure R 5.5 Vegetation Cover in 1990 Dry Season

Data on : 4 to 6, Jan
13 to 15, Jan

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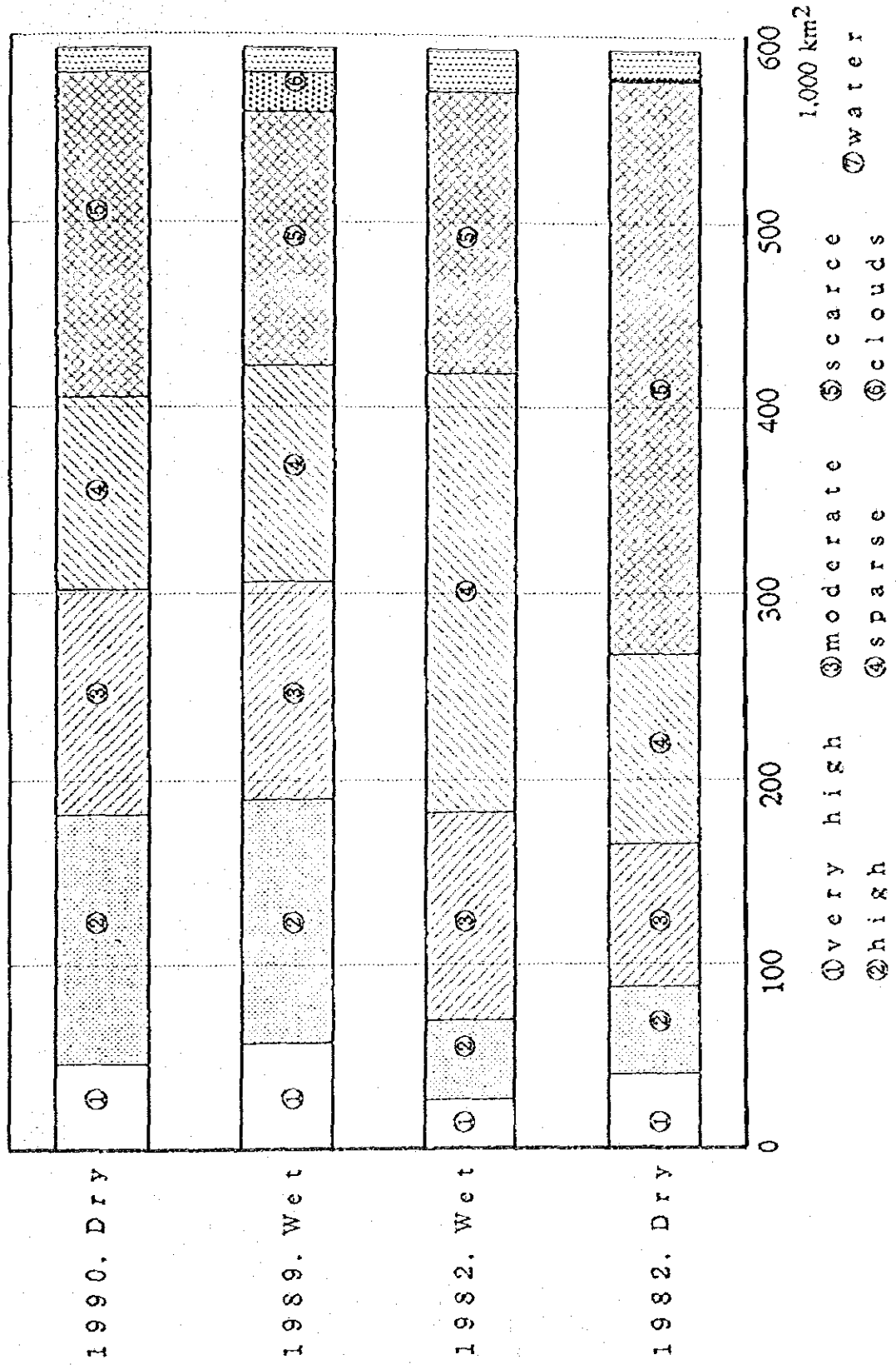


Figure R 5.6 Vegetation Cover by Year/Season

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1982dry-1982wet

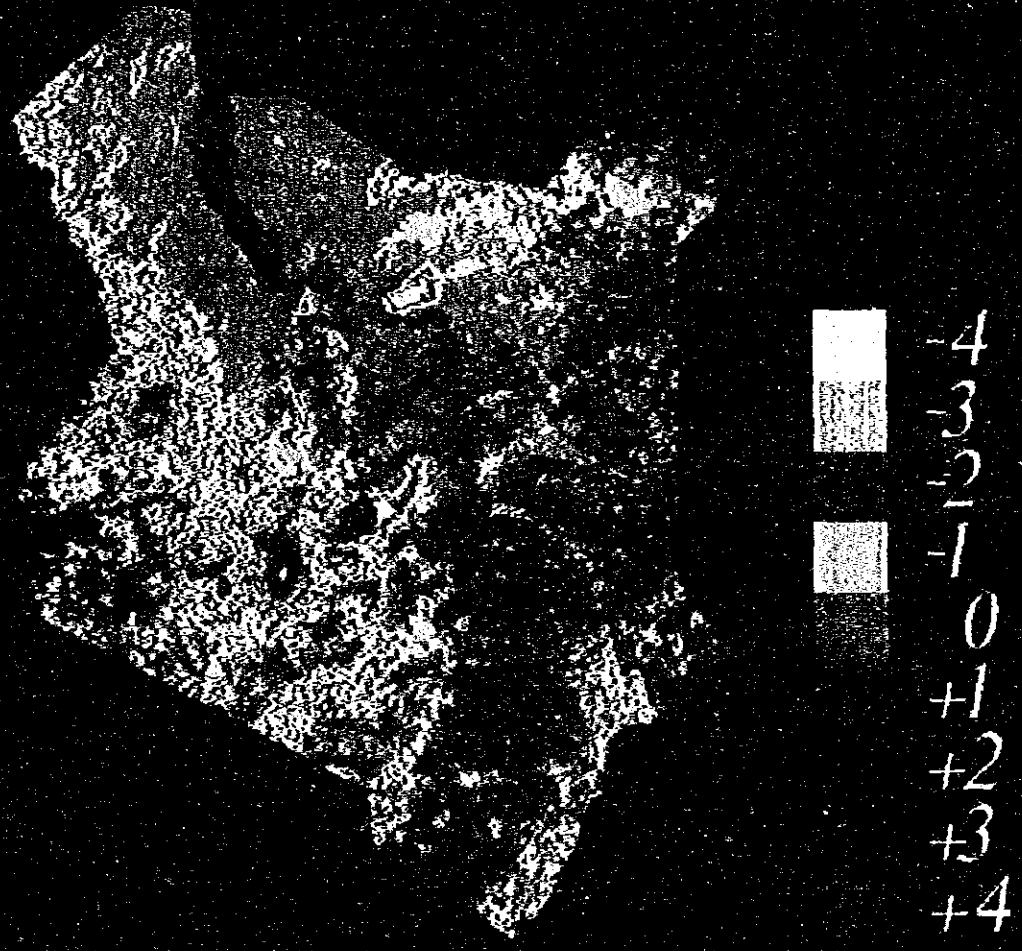


Figure R 5.7 Vegetation cover compared between 1982 Dry Season and Wet Season (Map)

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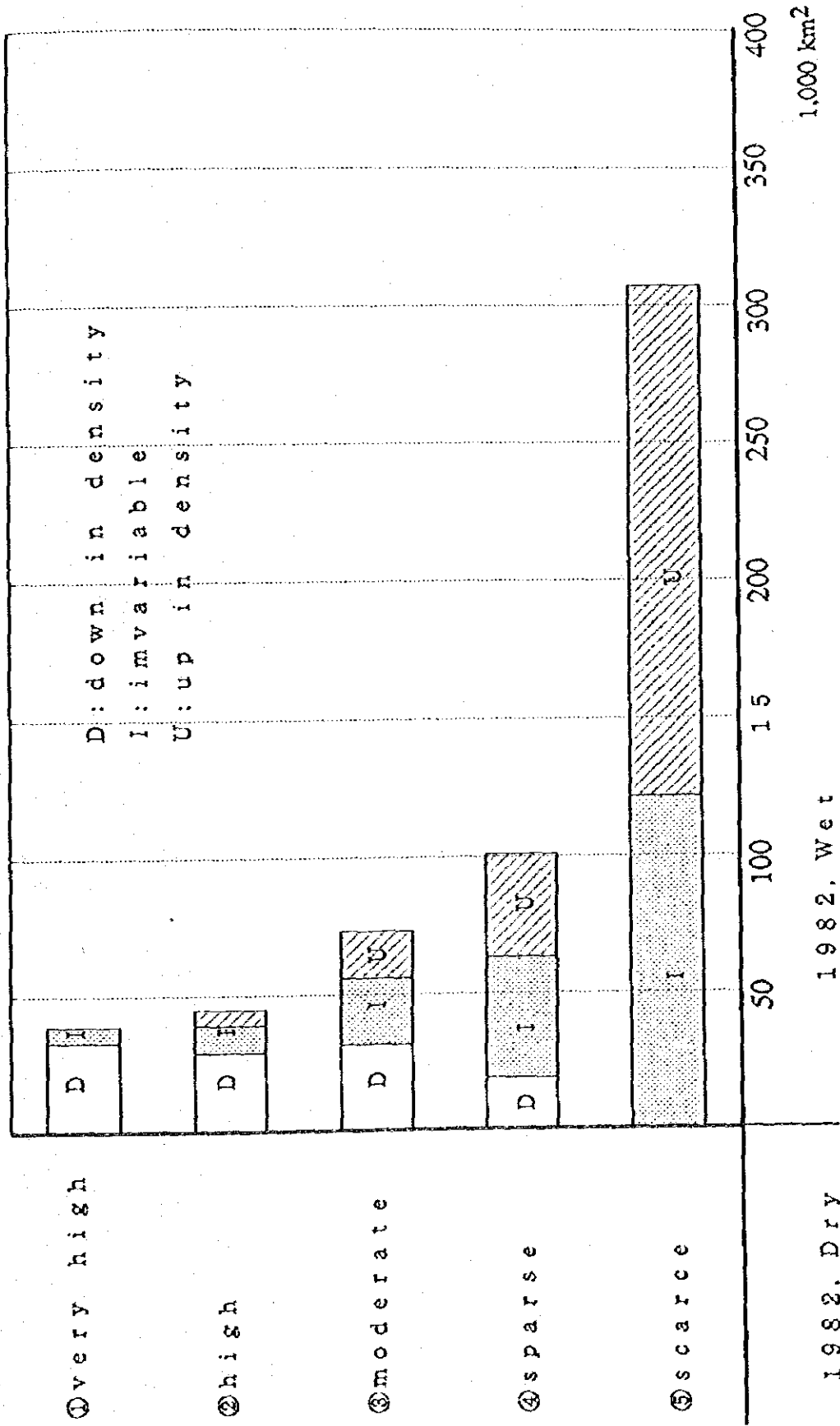


Figure R 5.8 Vegetation Cover compared between 1982 Dry Season and 1982 Wet Season (Quantity)

1990dry-1989wet

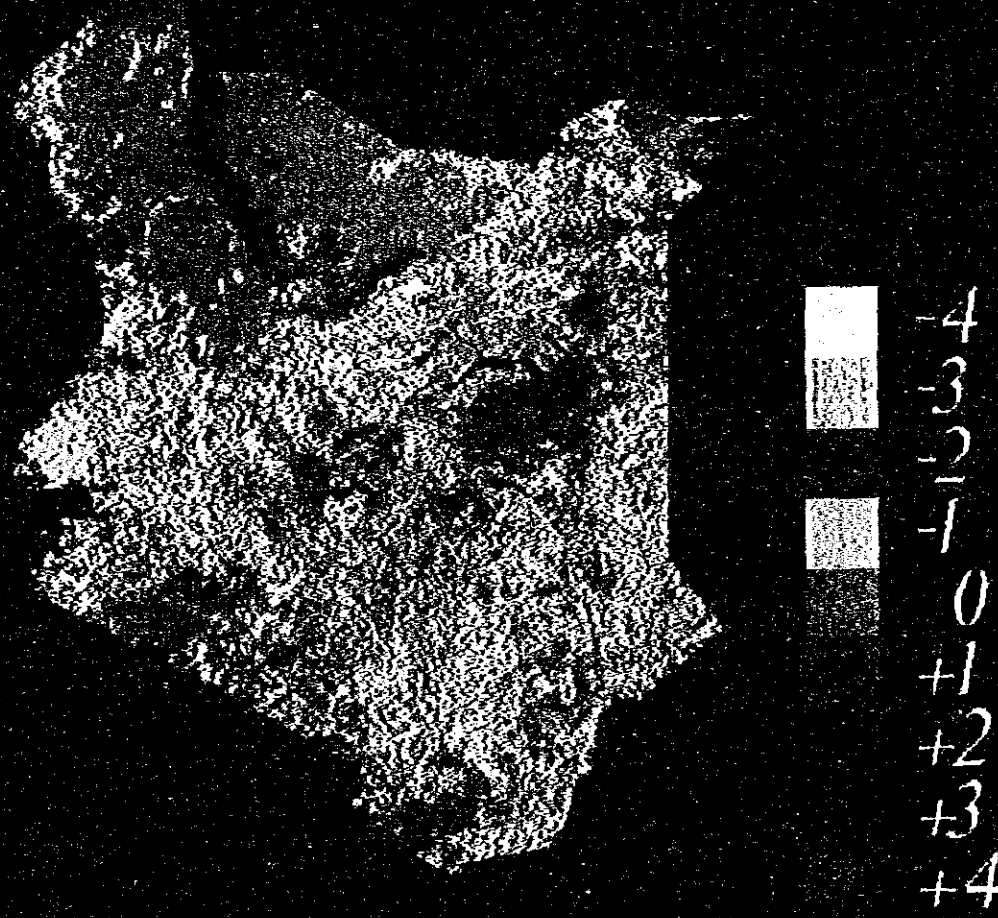
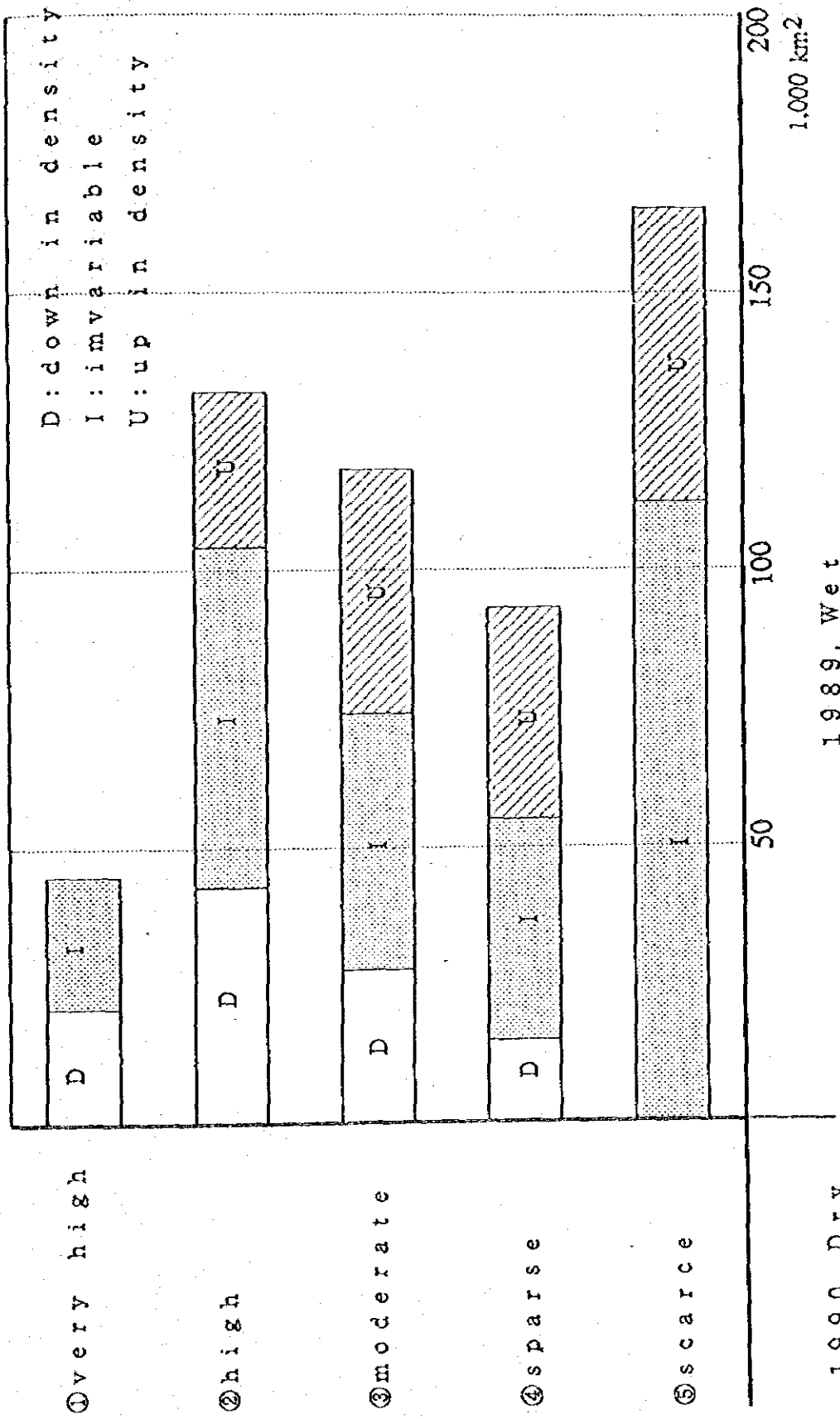


Figure R 5.9 Vegetation Cover compared between 1990 Dry Season and 1989 Wet Season (Map)

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1989. Wet

1990. Dry

Figure R 5.10 Vegetation Cover compared between 1990 Dry Season and 1989 Wet Season (Quantity)

1990dry-1982dry

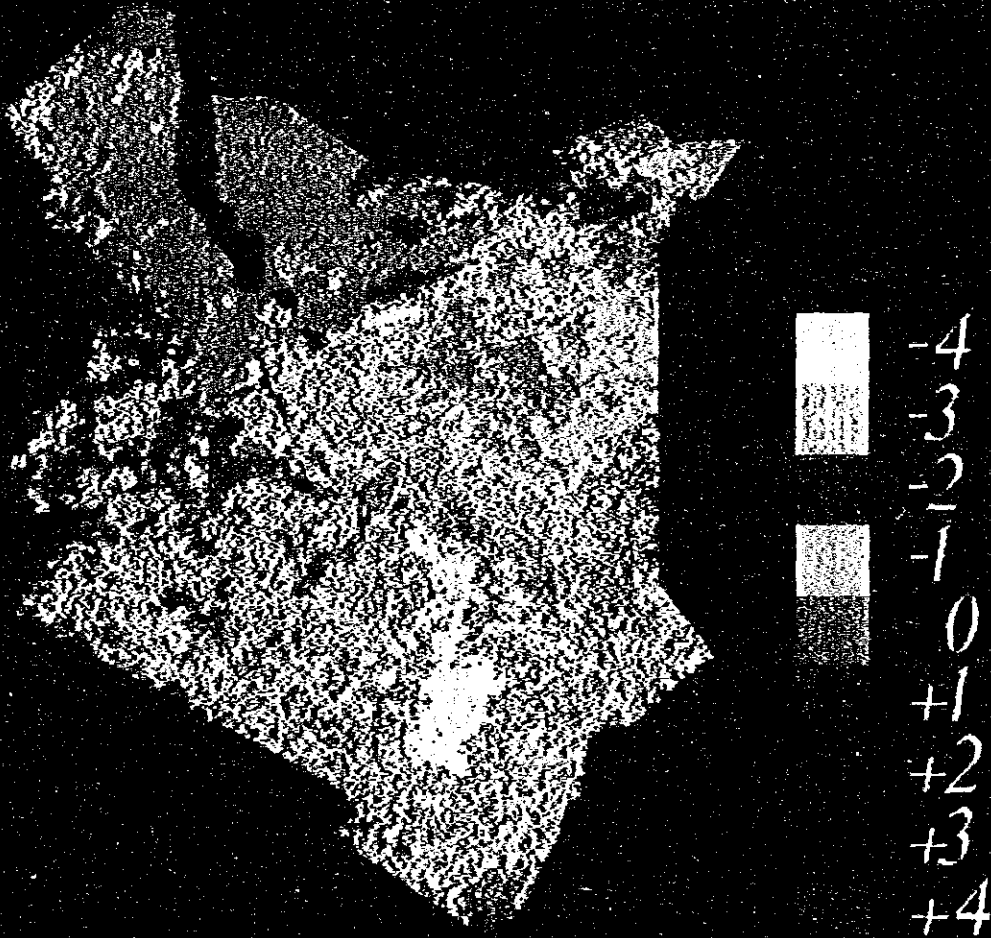


Figure R 5.11 Vegetation Cover compared between 1982 Dry Season and 1990 Dry Season (Map)

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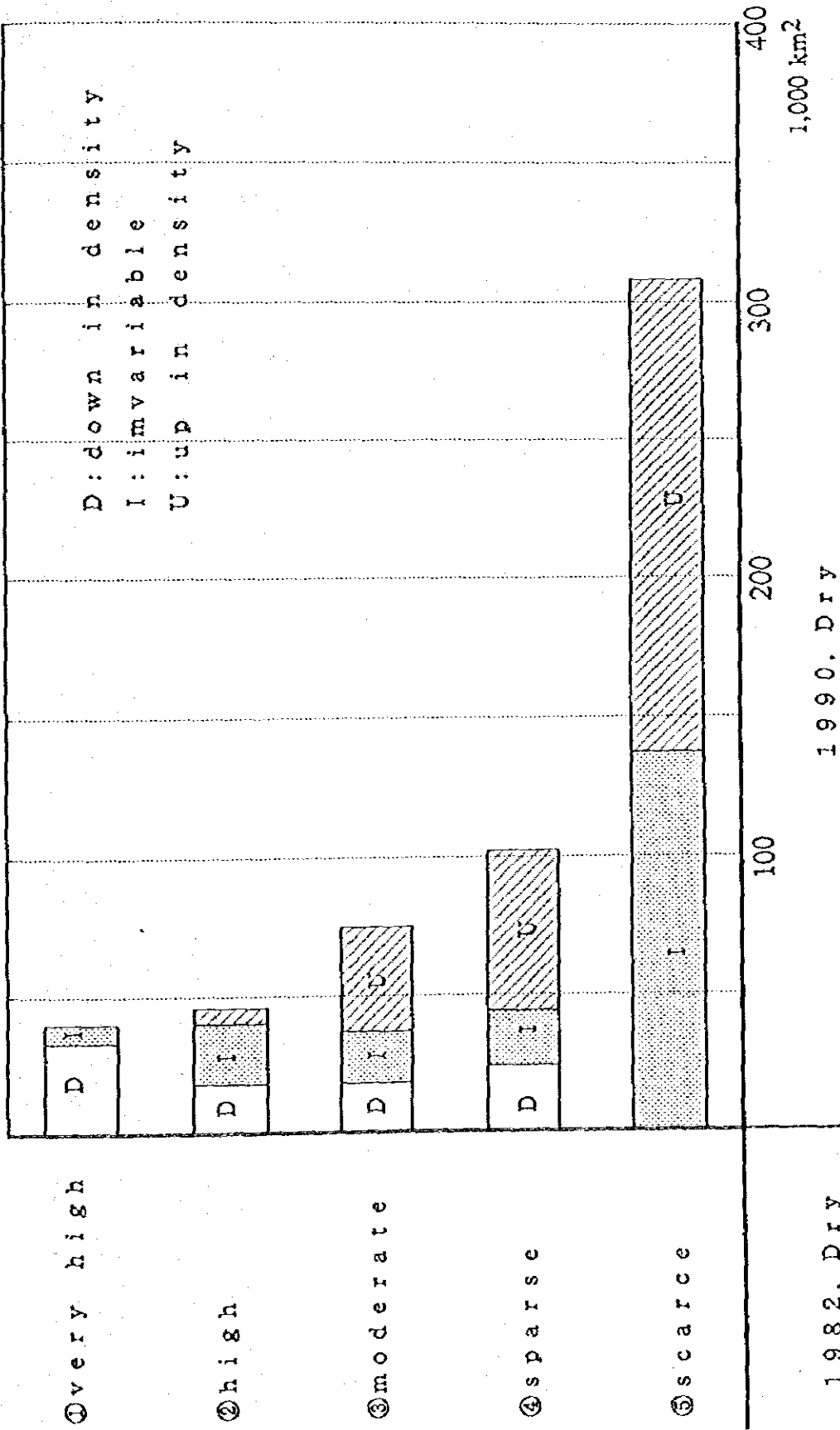


Figure R 5.12 Vegetation Cover compared between 1982 Dry Season and 1990 Dry Season (Quantity)

1989wet-1982wet

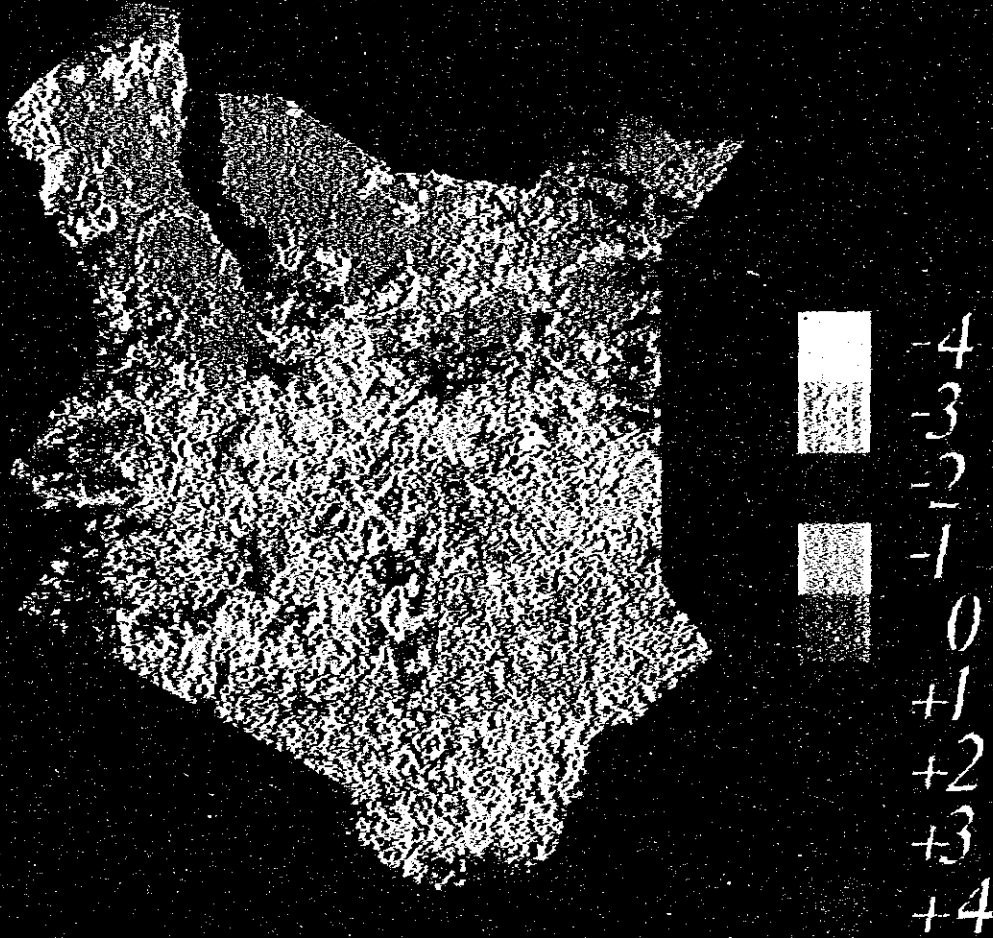


Figure R 5.13 Vegetation cover compared between 1982 Wet Season and 1989 Wet Season (Map)

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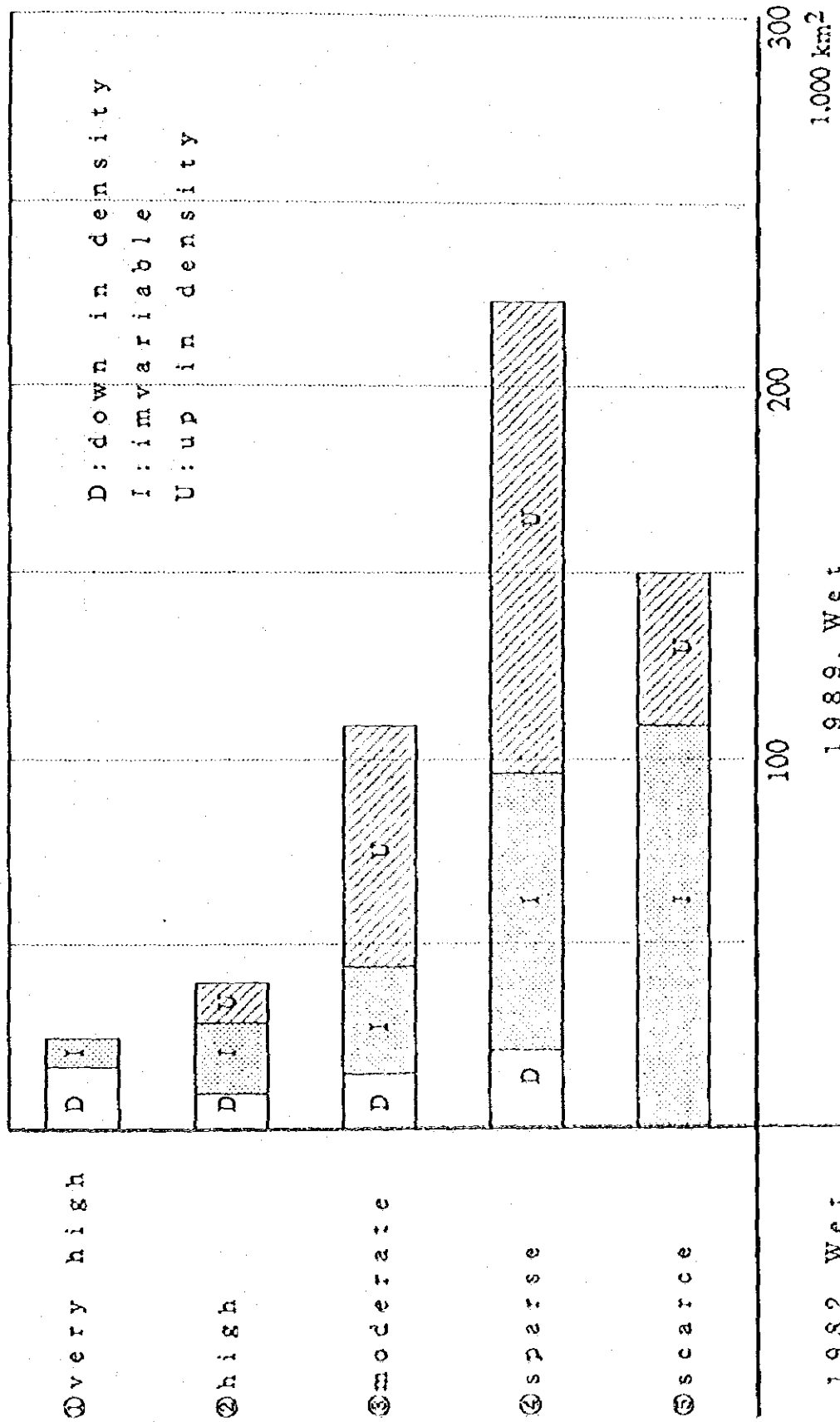


Figure R 5.14 Vegetation Cover compared between 1982 Wet Season and 1989 Wet Season (Quantity)

Fig. R 5.15

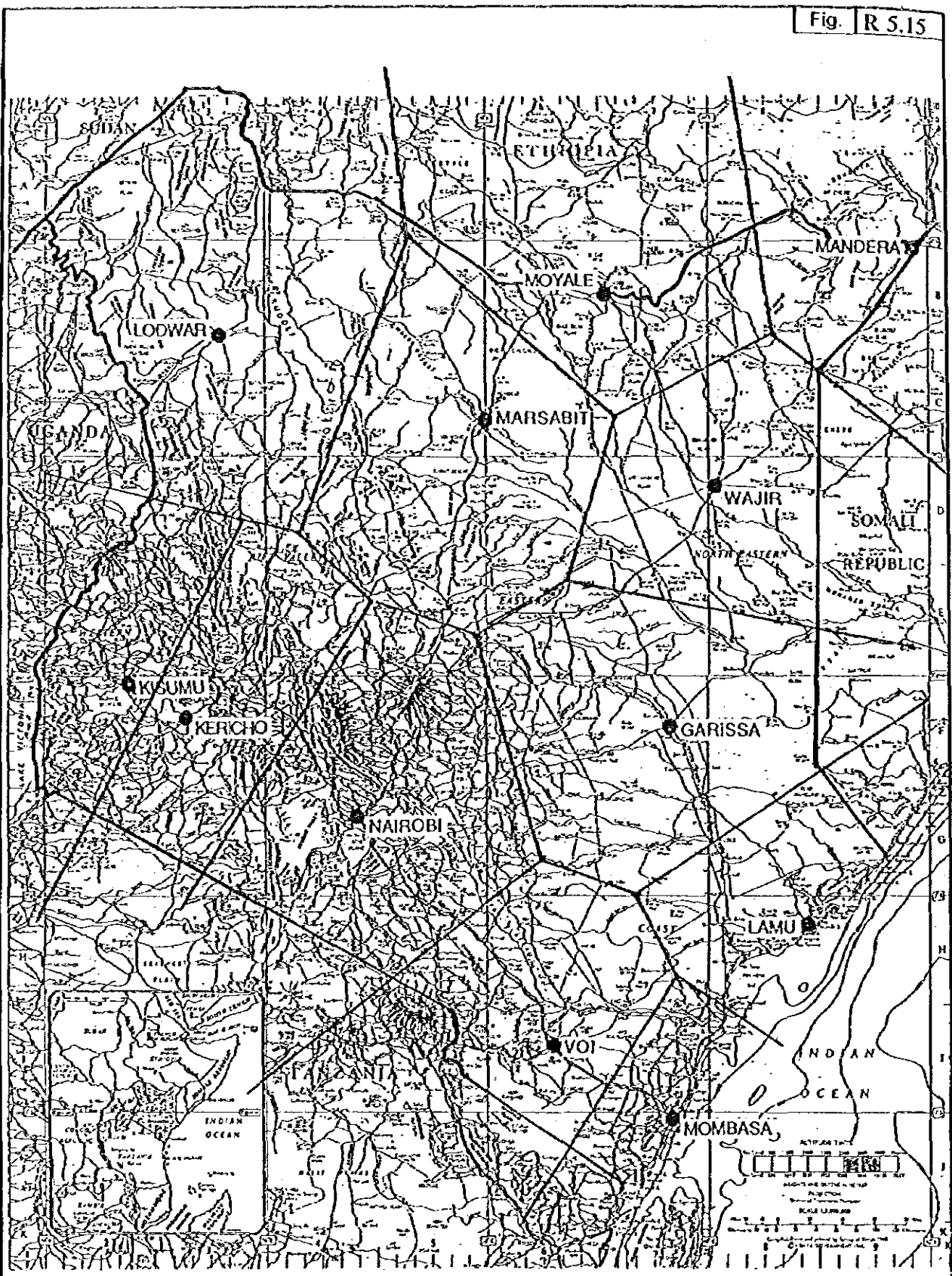


Figure R 5.15 Regional Divisions by Thiessen Method

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Unit : x 1,000 km²

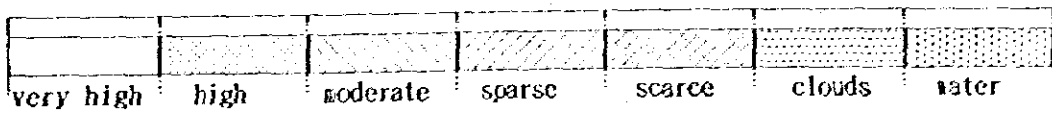
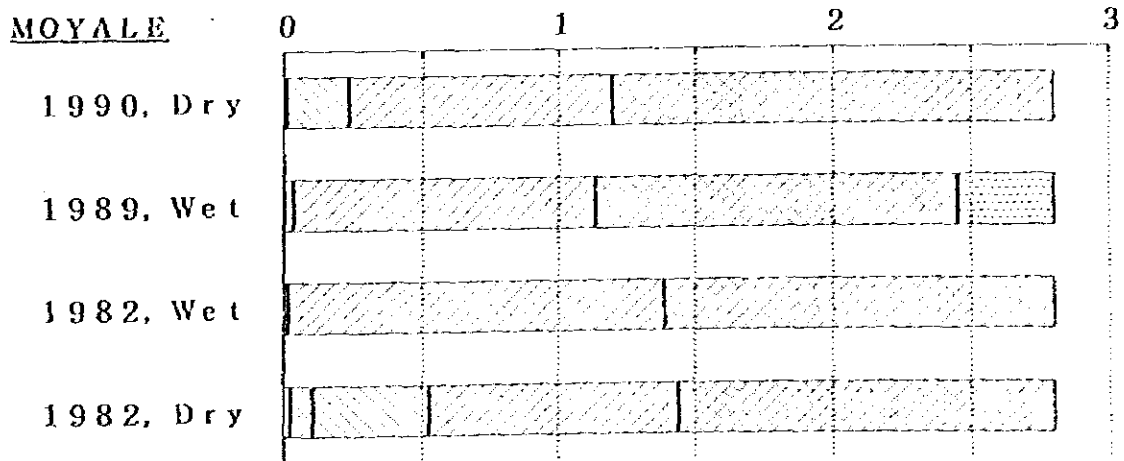
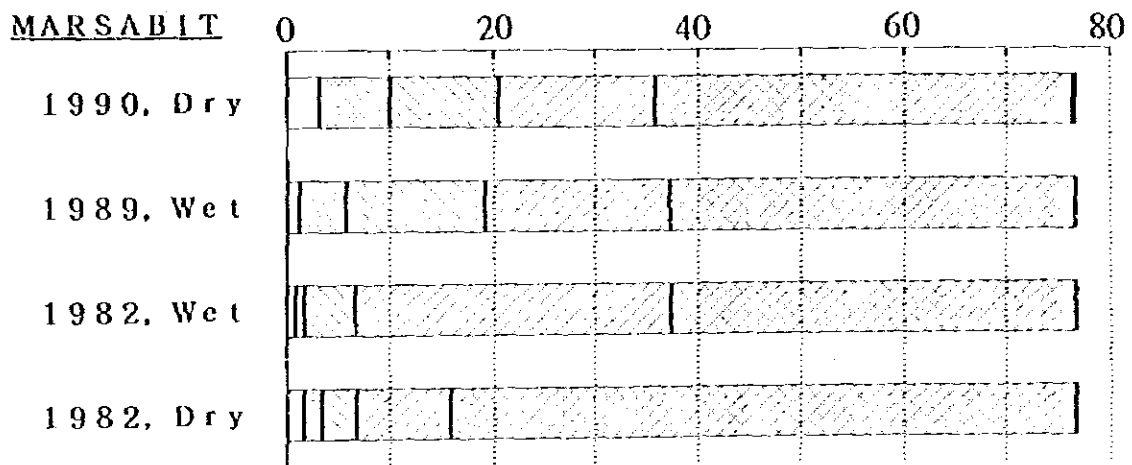
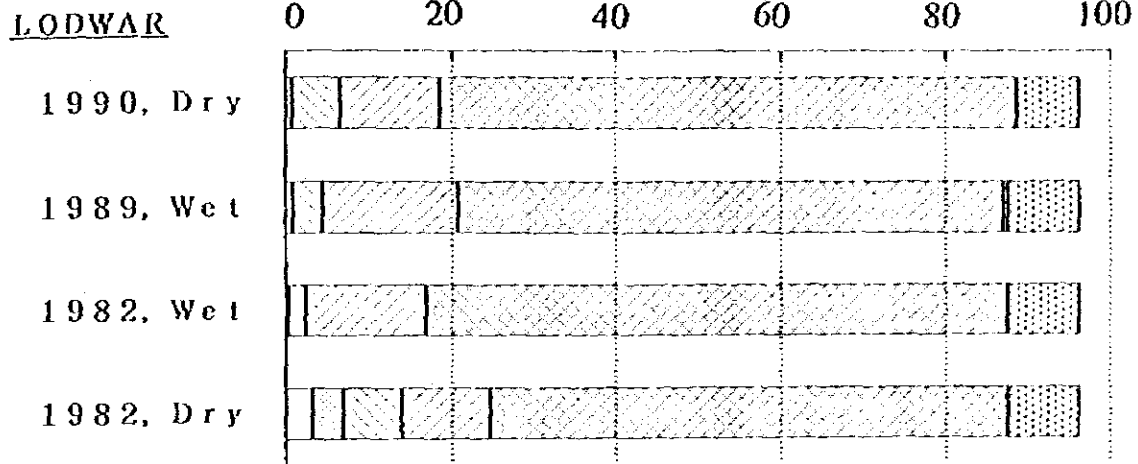


Figure R 5.16 (1)

Vegetation Cover by Region (1/4)

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Unit : x 1,000 km²

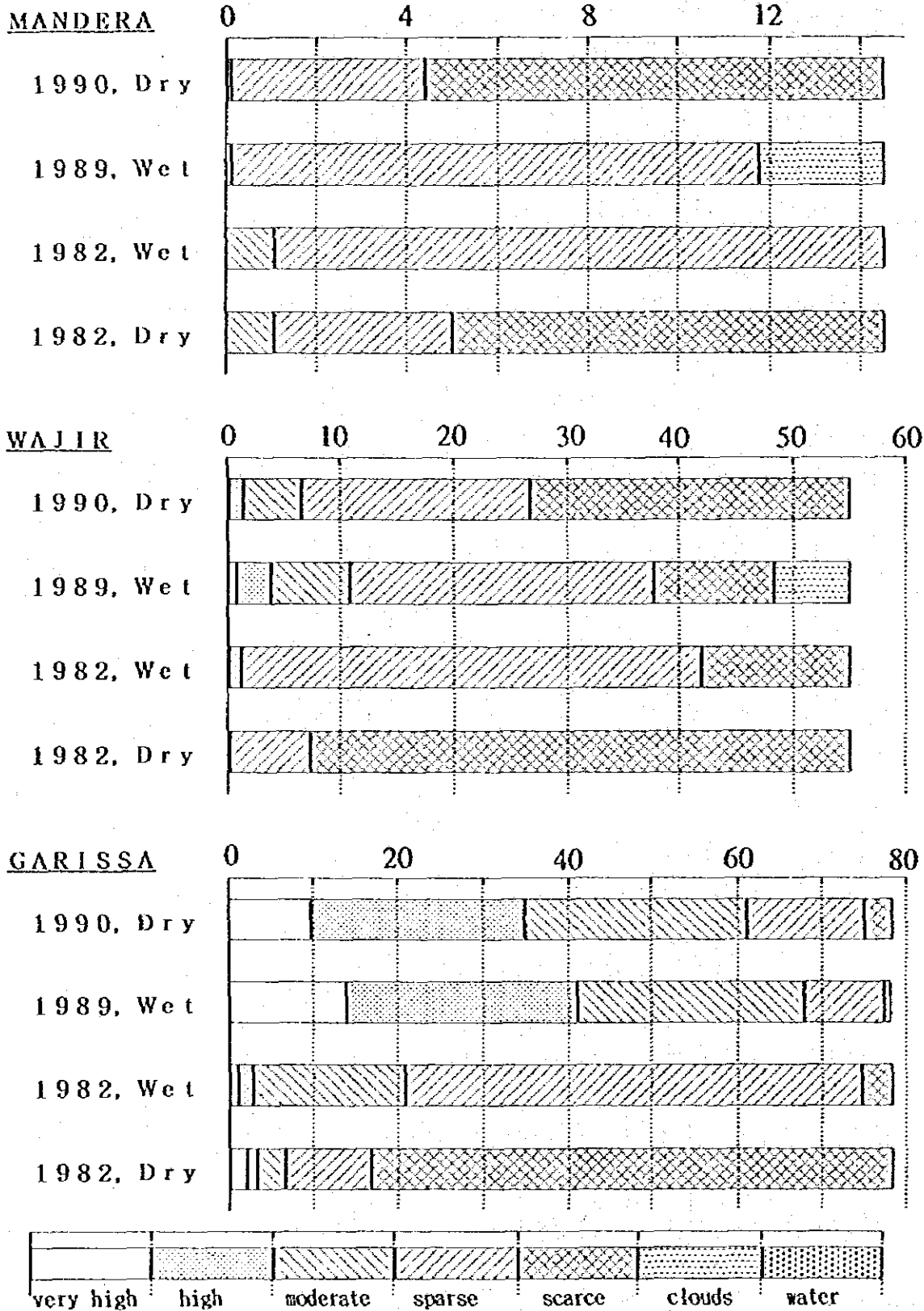


Figure R 5.16 (2)
Vegetation Cover by Region (2/4)

Unit : x 1,000 km²

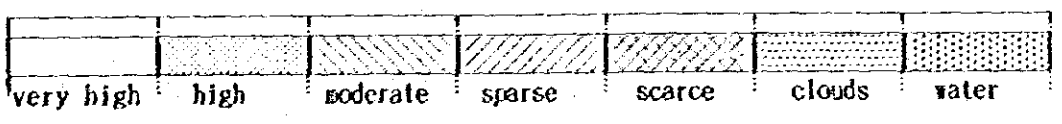
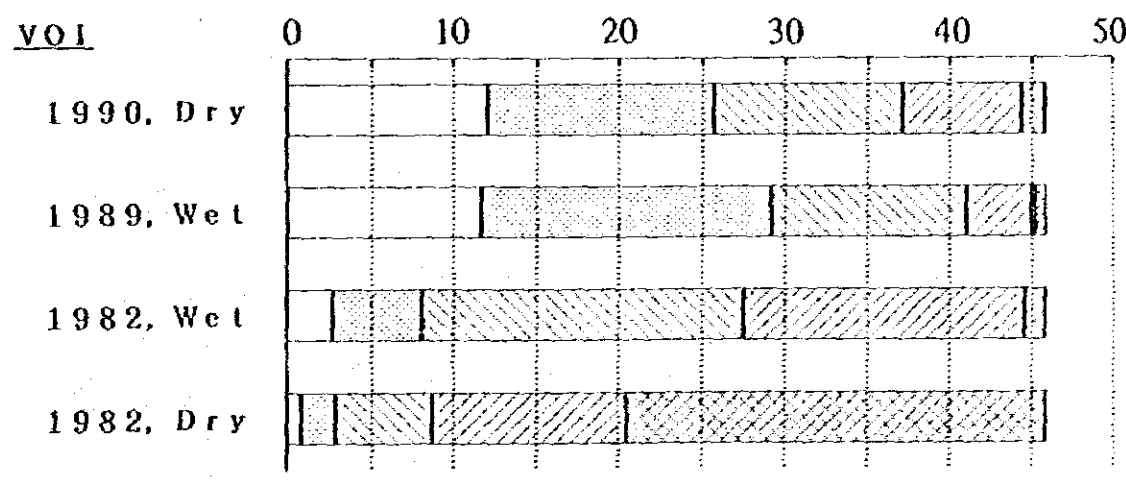
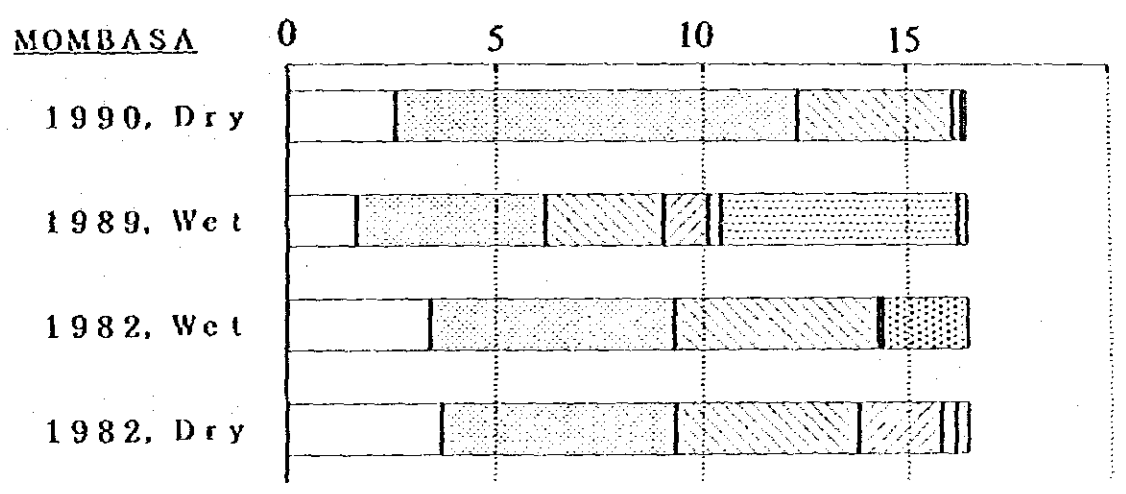
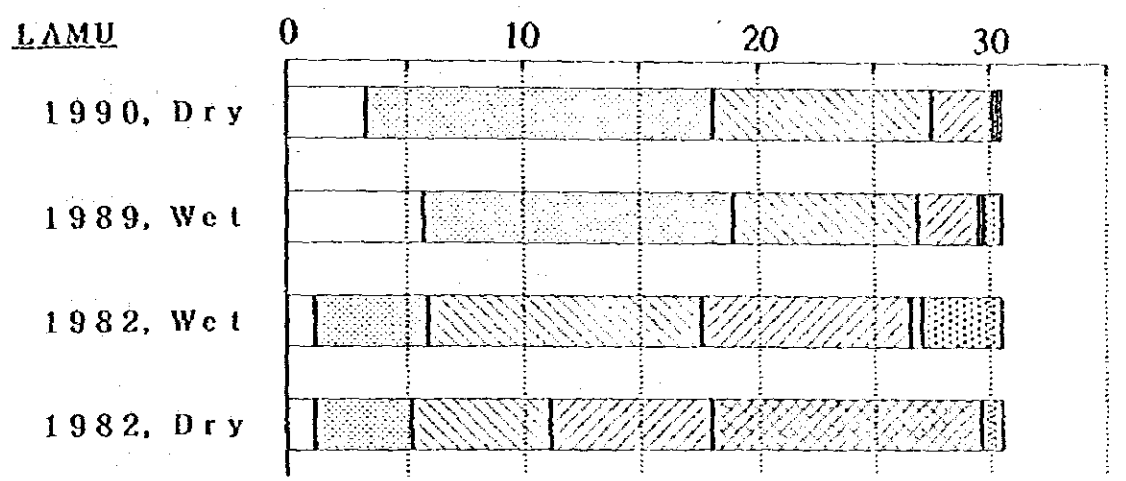


Figure R 5.16 (3)
Vegetation Cover by Region (3/4)

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Unit : x 1,000 km²

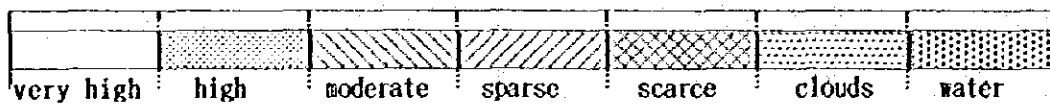
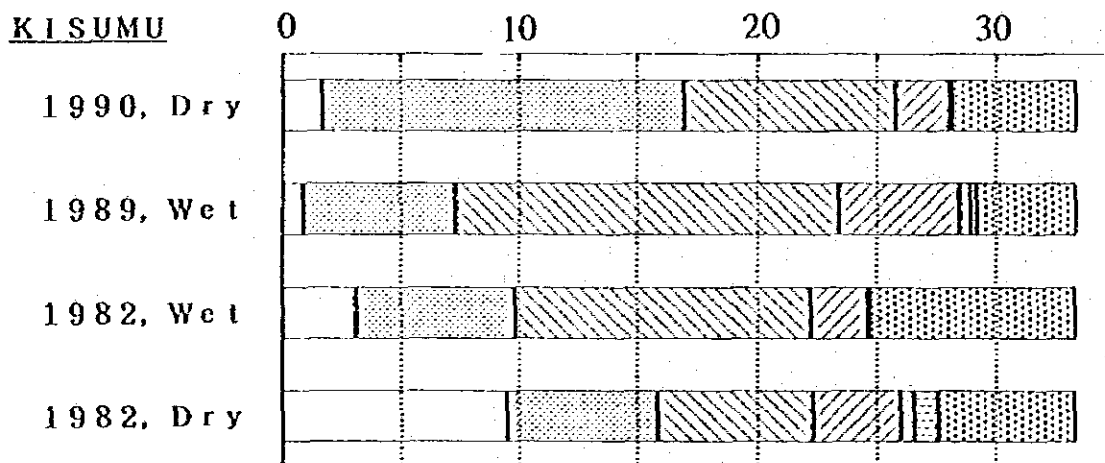
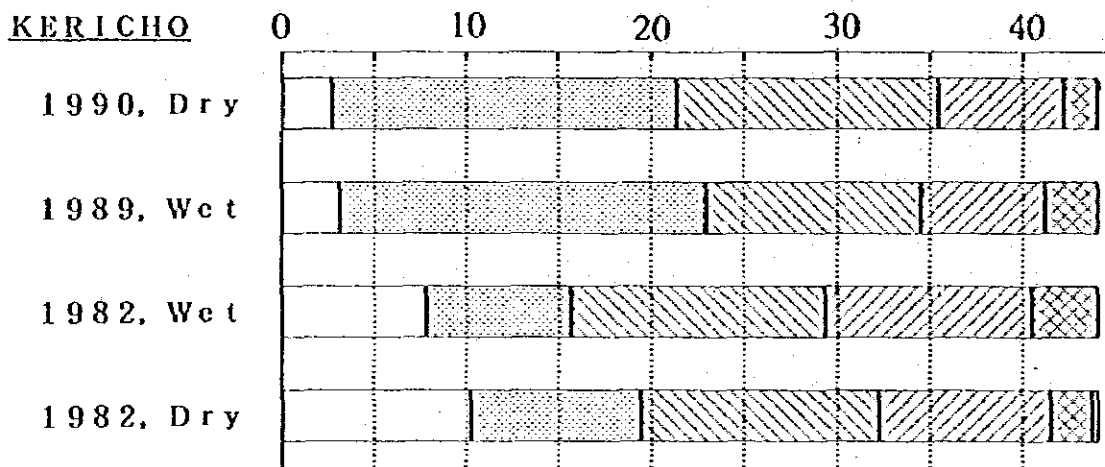
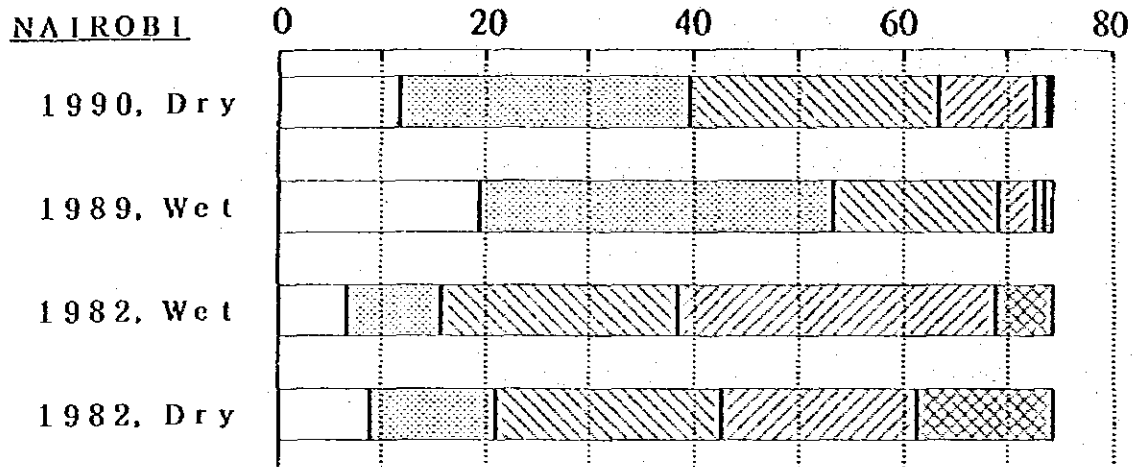


Figure R 5.16 (4)

Vegetation Cover by Region (4/4)

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